

## T13 Task Force Meeting

Date: 6/5/14

Location; Paulsboro Technology Center

Attendance:

SwRI - Martin Thompson, Jim McCord, Bob Warden

TEI - Mark Sutherland

Intertek - Brad Carter, Jim Moritz

Volvo - Bengt Otterholm, Allison Athey, Greg Shank

Afton - Christian Porter, Bob Campbell

Chevron - Shawn Whitacre

Infineum - Jim Gutzwiller, Joan Evan, Elisa Santos

Oronite - Mark Cooper, Jim Rutherford (via conference call)

TMC - Jeff Clark, Sean Moyer (via conference call)

Lubrizol - Jim Matasic, Mike Conrad, Kevin O'Malley (via conference call)

John Loop (via conference call)

ExxonMobil - Steve Kennedy, Mike Alessi

### **BOI Matrix Recommendations**

Discussed at NCDT, Mike wanted to present to the task force to allow for comments on the level of precision. Greg noted that EMA discussed last week and had been going back and forth between 2 and 3 technology options for the T13. Steve Kennedy wanted the group's input that the group was comfortable with the precision output from the matrix in moving from a design phase to a test phase for the T13.

Four viable options still exist for the T13 matrix. Elisa Santos; we have 28 runs, so with 2 technology design we have more runs per oil. Is concerned that with the three technology design, if any run goes "wrong" it has a greater impact on the overall results. Bob Campbell points out that labs are committed to valid runs, so we will have results from the correct number of runs, even if the results look funny. Overall, the price to pay for having three technologies is a reduction in the confidence of results if something odd happens with a run. Joan Evans mentioned that at the BOI meeting there was discussion on the two vs. three technology designs, but not a strong feel one direction or the other.

Bob Campbell noted again that on the back end of the matrix, we will likely have additional data points that help with the precision. Previously, targets were generated on every oil run in the matrix, so the additional data points may be on non-featured oil.

No additional runs from labs have been confirmed, and they can't be counted on for the matrix, but it is highly likely.

Mike brought up the possibility of TMC coordinating, with statistician input, what oils are run at on the extra tests. Jeff Clark was ok with helping out at this, should be done "real-time" with the matrix. However, we won't fully know targets until the end of the matrix.

Greg Shank was ok with a 3 sigma difference. It was noted that the 3 sigma detectable difference in option 9b was a “worst case” including things such as stand effects that may reduce.

### **Matrix Readiness Presentation**

More reference data is coming from an active run at LZ. PTC result 4 was on the new cylinder liners, was very mild, and did not break until 372 hours.

IAR New liner test was mild, pushed out to nearly 400 hours.

We have 3000 liners from one batch, so we will not be changing liners for a while. May need to have a correction associated with them but they will at least be consistent for now.

Run IAR79 (second run at lab, early break with boost leak) was relabeled as IAR2 to reduce confusion.

Greg’s feeling was towards KV40 and Oxidation. They seem to be better behaved than the Pb values.

Bob Campbell noted that anything we can do to get away from Pb as a parameter now will likely help us 5 years down the road when we try to get new bearings.

The KV40 break tends to be slightly behind the oxidation break, but when they go pretty much everything in the oil goes along with it.

Mike Birke (SwRI) is working with the labs to dial in the precision of the oxidation and nitration peaks. Nitration is less well behaved, but the peak that is being measured tends to be a very small area on the spectra.

Reproducibility data was shown for oils at various labs. Reproducibility KV40 plot shown indicated runs Lab 1 and Lab 2a were nearly identical, however lab 2b run showed a slightly earlier and more severe break. Runs 2A and 2B were the same stand, different engines. The earlier break on Lab 2B was very noisy on the peak/area measurements. Pb and KV40 values are smooth. Appears to be in the measurement of this particular test. Nitration didn’t really show anything of use.

HDD Prototype oil run at Lab2 and Lab3. Similar break time and response, lab 2 slightly severe of lab 3 run.

Bob Campbell asked if the three technologies selected are confident to not respond like TMC 821. We would like to take a look at performance data on the technologies in the T13 to assure the task force that we’re not getting something unsuitable for the test.

Greg will ask the suppliers if they will share the data.

### **Parts Update**

Bearings are batch A, ordered, and the first sets have arrived via air freight. Mark Sutherland noted that they first sets have arrived at TEI and should start going out to the labs shortly. The larger batch is in the States, on its way to TEI.

Liners have been ordered in large batch (3000) and should be at TEI next week. They are 2014 GHG liners out of Mexico. All liners coming from a single line out of Mexico, so hopefully we will have a more consistent product.

### **Procedure**

Sean Moyer has been working on the procedure and report forms.

*Matrix will be run entirely on new liners, new heads, and batched bearings*

### **Concerns**

Statistical analysis continues to determine if OC is driving the test. May not be real, but we're still looking at it. The hope is that a single batch of dryer liners will reduce the noise in the test.

Latest TMC 821 data on new liners appears to be milder.

Severe test can be difficult for some oils to complete 360 hours of operation; this circles back to a question on if matrix oils will survive the whole test.

### **WebEx with Jim Rutherford**

Photo: Jim is photo-bombed in 1980 while standing in front of a small tree and snow on the ground.

New: IAR83; PTC4, "Lab1" and "Lab2" reproducibility data. LZ run is first run

KV40 was shown as percent increase from 0-hour data

Plots shown for hours to 75% Vis increase and average exhaust temp.

### **Concerns**

OMS Units; should we be replacing the base each time, or just the top half? Might want to pin gauge the jet opening and determine if they are a tightly held tolerance. Should we be establishing a CCP set point to make the downstream pressure consistent?

Oil Gallery and Jet Pressures seem to have some variation on the TMC821 oil even within a lab. There were at least 4 internal regulators on the engine which may be playing a role in this.

### **Reproducibility Operational Data**

May have been run with different insertion depths for various oil T/C. Shows the importance of depth and location between tests/labs.

### **Matrix Readiness Checklist**

Mike went through the checklist for the PC-11 MOA acceptance.

The largest concern is if the variation in the oil response provides adequate precision based up on the current test results. Greg felt that he was ok with the

**Motion:** Greg Motions that the T13 Task Force declares it ready for the Matrix test. Seconded by Mike Alessi.

Company	Yes	No	Waive	Comments
TMC			X	
IAR	X			
SwRI	X			Are swing engines ok through the matrix?
Afton	X			
Lubrizol	X			
Oronite	X			
Chevron	X			
Volvo/Mack	X			
Exxon-Mobil	X			
Infineum	X			
TEI	X			

Motion Passes.

Comment response: Is calibration for an engine/stand or just a stand? Jeff; from a historical standpoint we typically calibrate just a stand for a full rebuild test. Guidance is to run the matrix the same way we are going to run the tests.

Consensus: Running with swing engines is ok.

### Report Forms

Motion: Increase engine ID field to 12 places from 6.

Passes unanimously